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ABSTRACT

A study examined the perceptions of employers in the aircraft maintenance industry regarding the effectiveness of recent graduates of Federal Aeronautics Administration (FAA)-approved maintenance schools. Of the 100 employers who were contacted, 68 returned usable surveys. Based on responses, it was concluded that the views of employers in the aviation industry concerning the effectiveness of programs to train aircraft maintenance technicians parallel those views expressed by aviation mechanics educators in a 1979 national opinion survey conducted by Johnson and Ziegler. Ninety-seven percent of the employers surveyed felt that aviation mechanics educators should have at least two years of work experience before teaching, 83 percent thought that less time should be devoted to wooden structures, and 77 percent indicated that more instructional time is needed for turbine engines. Although more than 98 percent of the respondents advocated additional training in a variety of subjects, few wished to change or reduce training in the present curriculum. (Appendixes to this report include the survey instrument, selected responses to open-ended questions included on the survey, a list of those employers contacted during the study, and a complete tabulation of responses to the individual survey questions.) (MN)

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A SURVEY OF THE AIRCRAFT MAINTENANCE INDUSTRY TO SOLICIT PERCEPTIONS REGARDING THE EFFECTIVENESS OF RECENT GRADUATES OF F.A.A. APPROVED MAINTENANCE SCHOOLS

by

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CHAPTER 1

INTRODUCTION

Need for the Study

Apprentice mechanics entering the world of general aviation maintenance face many items of complex, sophisticated items of equipment for which they have had little, or at most, inadequate training. The Allen report (1970) commissioned by the Federal Aviation Administration and completed in 1970 is the basis for all F.A.A. approved aviation maintenance schools in the United States.

Many of the present day "state-of-the-art" technical developments were unknown during the 1965 to 1970 era. Many of the aircraft and powerplant systems and components used by general aviation aircraft manufactured during the era of the Allen Report data gathering period are no longer used in modern aircraft. In spite of this fact, most of these older systems and techniques are still being taught in the aviation maintenance schools today as a specific requirement of Federal Aviation Regulation, Part 147. This regulation is the governing authority for all F.A.A. approved aviation maintenance schools, under Federal law, Title 14, Code of Federal Regulations, Part 147.

Johnson and Ziegler (1982) reiterated the fact that the Allen Report is the underlying structure for today's aircraft maintenance curriculum as directed by F.A.R. Part 147. Given that the aviation industry has changed, it would follow that the training of aviation maintenance technicians may also need appropriate modification.

At the 1982 national conference in Boston, the Aviation Technical Education Council (ATEC) decided it was time to poll its membership about F.A.R. Part 147. ATEC realized that there were at least two major populations that understood F.A.R. 147 and the current status of aviation maintenance training; (a) aviation maintenance educators, and (b) the aircraft maintenance industry itself. It was understood that the ATEC survey would be of the maintenance educators only.

One of the conclusions reached by Johnson and Ziegler (1982) was that the next step should be a study of the aviation industry to determine its perceptions of the aviation maintenance school graduates. The present study is directed to this segment of the general aviation population, the aviation repair and overhaul facilities which may be found at the local airport in every city of medium size located throughout the United States.

The field of aviation maintenance is a diverse operation containing within its boundaries several different occupational specialties such as agricultural spraying and

dusting, air taxi and charter operations, medical evacuation, flight training, business and executive transportation, and many, many other special functions for which only an aircraft is capable of performing the functions required. Each of these occupational areas must operate under the regulation and control of the Federal Aviation Administration, and a separate set of regulations have been issued to cover these many diverse type of operations. The larger commercial air carriers maintain their own training departments to provide the additional training required by the maintenance personnel whom they employ. Likewise, the new employee entering the manufacturing sector of general aviation can also be quickly trained in the special skills required by the aircraft manufacturer in building his product. For these reasons this study did not include these employers. The extremely large population under the broad classification of general aviation will allow for replication of this study at a later date in the event that it would serve a useful purpose to do so.

The aviation maintenance students are required to study radial engines, hydro-matic propellers, direct current generator systems, fabric covering methods, and other outdated maintenance procedures of the 1940's and 1950's. At the end of the required two year course of study, the students are tested on these outdated procedures, and before they can receive a Federal license to perform maintenance

on U.S. Civil aircraft, they must also demonstrate their proficiency in these same maintenance procedures by passing an oral and practical examination.

When these same young mechanics enter the world of 1984 aviation technology, they are faced with computer oriented maintenance procedures, micro-fiche maintenance manuals, and turbo-charged, fuel-injected, engines, equipped with constant speed, full feathering, reversible propeller systems, solid state voltage regulation systems, three phase electrical alternator systems and an unending list of new, complex, highly sophisticated electronic regulator and control panels for which they have received little, or no training. In fact much of this new equipmnet is unknown to their instructors, due largely, to the lack of any requirements for instructor upgrading in the new technology.

An excellent article by Schockley (1983) discussed the use of computers in the maintenance department of aviation repair shops. There have been many interesting functions and programs which have been revised or modified to aid the A&P mechanic in maintaining historical records, airworthiness directive compliance and many of the other required record keeping functions of the aircraft maintenance department. The article is of interest to the individual shop owner. Major (1983) writes about how one major aircraft manufacturer has turned to computers and become deeply involved with the fixed base operators

in the maintenance function of their aircraft. Beech Aircraft Corp. Wichita Kansas is now inputting into the computer everything about the airplane at the time of manufacture, virtually every single part and every single serial number.

Beechcraft maintains a thorough and ongoing history of the aircraft, including the number of hours it flies each month, the average length of each flight, as well as all maintenance and repair work. Its computer can now estimate when maintenance is due, and which items may require special inspections. The new systems will allow Beechcraft Corp. to maintain their aircraft more accurately, and also to have the necessary replacement parts on hand when needed.

The use of computers is not presently a requirement of the A&P maintenance training program, but the two articles above outline many ways by which the use of computers may be used to save time, improve the efficiency of the daily maintenance operation, and to promote safety in general aviation as well as in the executive and commercial air carrier operations.

Simmons (1984) Director of Navy Programs for a major computer manufacturer, in a recent interview regarding the use of computers in maintenance training for the Department of Defense stated that they are the leaders in sponsoring this approach to maintenance training, and that

they have gathered voluminous amounts of data that indicate maintenance simulators can be designed for training, cost less than that of original equipment, and produce technicians whose abilities are as good or better than those of technicians trained on real equipment.

Aviation maintenance schools cannot be all things to all people, especially to the types of aviation maintenance technician consumers, the employer of the apprentice mechanic. There can be little doubt that a major revision to the aviation maintenance training curriculum is long overdue.

Purpose of the Study

The purpose of the study was to solicit perceptions of general aviation aircraft maintenance shop operators regarding their opinions as to the overall effectiveness of the typical apprentice aircraft maintenance technician after completion of the F.A.A. approved maintenance training program. The present course material is based on a study completed over fifteen years ago. The rapid advancement in aviation technology has rendered many aircraft systems and procedures obsolete. It is vitally necessary for the future of aviation that the aircraft mechanics training program be revised to reflect the latest technical advances.

Research Questions

1. Is the newly certificated maintenance technician employable and qualified to service modern aircraft systems?

2. Should the airframe and powerplant maintenance curriculum be revised and updated to train the aviation maintenance technicians in the latest systems.

3. How often should the A&P school curriculum be evaluated?

4. Are A&P maintenance school instructors current in their occupational specialty?

5. Should A&P maintenance school instructors be required to keep proficient in the occupational specialty?

Definition of Terms

Aircraft Maintenance: The repair, building, modification and inspection of U.S. Civil aircraft. Procedures for accomplishing these repairs are published by the Federal Government.

Annunciator Panel: A computer operated panel in view of the pilot of an aircraft whereby a series of warning lights will alert him of any non operating system on the aircraft.

A.T.E.C. an abbreviation for the Aviation Technical Education Council. An organization of educators formed for the purpose of implementing improvement of training in the aviation industry.

F.A.A. an abbreviation of the Federal Aviation Administration, a government bureau charged with the safety of air commerce in the United States. One of their largest responsibilities is the licensing of all airmen, mechanics, pilots, and anyone connected with the aviation industry.

F.A.R. Federal Aviation Regulations. One of the methods used by the Federal Aviation Administration to regulate and control the aviation industry. The F.A.R.'s are reprints fo Title 14, of the Code of Federal Regulation pertaining to aviation maintenance.

CHAPTER 2

RELATED LITERATURE

The question asked by Dr. Johnson and Mr. Ziegler in the 1982 "National Opinion Survey" was: "Is the newly certified maintenance technician employable and qualified to service modern aircraft systems?" The study was conducted by the Aviation Research Laboratory of the University of Illinois at the request of the Aviation Technical Education Council.

The primary objective of the survey was to determine the opinions of school administrators and instructors concerning the suitability of F.A.R. Part 147 for regulating today's airframe and powerplant maintenance training programs. To identify specific subsections of the regulations that require further evaluation, and perhaps revision or elimination.

The National Opinion Survey was a mailed questionnaire, a cover letter, a complete copy of F.A.R. 147, and a stamped return envelope. The mailing list included all certificated A&P schools and all A.T.E.C. members. A total of 256 questionnaires were mailed on June 12, 1982 with a return deadline of July 9 stamped on the outside of the return envelope. The response rate was 64% after an extended

deadline to July 19 was given. A total of 63 responses were received.

The questionnaire was a Likert-type rating scale with 25 multi-section questions covering many aspects of the maintenance training programs. A few of the responses and comment received are listed below;

1. 50% of the respondents agree that A&P schools should be required to periodically update their curricula and apply for reapproval every 5 years.

2. 48% of the respondents were in agreement that additional specialized ratings are needed after a basic A&P license is obtained.

3. 63% strongly agree that A&P maintenance instructors should have 2 or more years of field experience.

4. 44% agree that A&P maintenance instructors should be required to have education theory courses in preparation for better teaching.

5. 56% agree that maintenance schools should be required to complete a formal evaluation of their curriculum every five years.

6. 54% agree that the F.A.A. inspection is a necessary check on a maintenance schools program.

7. 69% recommend a decrease in the time spent studying wooden structures.

8. 66% recommended an increase in the time spent on turbine engines.

9. 70% agree that there is a shortage of properly trained and qualified mechanics.

10. 55% expressed the opinion that aircraft mechanics graduated from A&P schools are not adequately qualified for today's aircraft.

A serious drain of qualified mechanics was exposed by Feller (1982). He discovered that office machine repairmen are offered better starting salaries than can be found in the general aviation industry, and a large number of A&P school graduates are being lured away from the aviation industry through offers of better working conditions, higher salaries, less danger of product liability lawsuits, and lessened responsibility in the event of maintenance errors.

IBM, and others in the office equipment manufacturing business recognize the type training received by the A&P maintenance school student, and realize that this training in the use of handtools and other related system also make them ideal candidates for specialized training in office machine repair and maintenance.

The Medical equipment companies, hospitals and even heavy farm machinery companies are making employment offers to A&P mechanic school graduates. Thousands of young mechanics are leaving the aviation industry and entering the business world at higher salaries and better working conditions than they can find in the aviation field.

Unless the aviation industry is willing to offer better inducements than the competition, the shortage of trained mechanics may become more severe than it is today.

Schockey (1982) takes a look at the computer in the maintenance department of the future. He discusses the computers function in parts inventories, bookkeeping systems, and other areas where the computer can reduce the shop workload.

The way most of the computers are utilized is to provide an exchange of pertinent information regarding the aircraft to provide periodic updates to the customer. For inspection purposes, the items requiring recurring inspection at certain time intervals, special one-time safety inspections and specific time change items can all be printed out at the touch of a key. The time saved by the mechanic in researching the aircraft historical records can be substantial. This time saving can be directly translated into cost savings for the aircraft owner.

The military concept of training aviation maintenance technicians has changed drastically during the past forty years. This writers personal experience during the extensive maintenance technician training programs at the beginning of World War II, and continuing through 1946 are still fresh. The Air Training Command took thousands of newly inducted personnel in, pushed them through an intensive nine month accelerated course in aircraft mechanics at Lincoln, Nebraska, Kansas City, Missouri, Sheppard Field, Texas, to name only a few, then these same mechanics were sent to flying units and put to work on a wide assortment of military aircraft.

The flying equipment of the war years was relatively simple in comparison to the equipment operated today. The newly created mechanics received the basic skills which enabled them to function, and more important to learn additional skills by actually working on the operation aircraft employed in combat by their respective flying units.

This sytem of training is still the prevailing method of training aircraft mechanics today in the civilian aviation industry. The military long ago changed their training procedures for aircraft mechanics.

As the military aircraft became more complex, the mission requirements of the different Air Commands became more diverse, the training requirements of the military mechanic necessitated a major revision. The basic skills are still vitally necessary, but no one training source can provide the varied training required by all of the major commands, and no one mechanic would ever required the knowledge necessary to service and maintain all of the different types of aircraft. The age of specialization was forced on the military services, and by the 1960's drastic changes in aviation mechanical training had been instituted in the military training schools.

Today the military trained mechanic is a specialist who is proficient in one or two system on the aircraft to which they are assigned. A highly trained specialist

in liquid oxygen maintenance, ejection seat specialists, Turbine engine mechanics, Radic communication and navigation system mechanics are all available for maintenance of the military aircraft. Allen (1980) explains the team concept in use today by the military, where the aircraft are serviced and maintained by a group of specialists. The old crew chief method of the past was too expensive in terms of training costs to continue. Comprehensive training in all systems for each mechanic resulted in unused knowledge and has been replaced by the specialist concept. Today a specialist can be trained in a matter of weeks, and be combat ready for assignment to a squadron of aircraft, instead of to a crew maintaining just one aircraft, as in the past.

This method of aircraft maintenance is also slowly evolving in the civilian aircraft industry. Many of the major aircraft manufacturers have been offering factory training on their products for years. Normandy (1982) covers the factory authorized schooling offered by Piper Aircraft Corp. through Flight Safety International, and the Lycoming Engine Company and Bendix Aerospace systems are just a few companies in the aviation industry who offer advanced training on products which they produce.

Perhaps it is time for the general aviation industry to further promote this advanced factory training and consider the possibility of petitioning the F.A.A. to issue

type ratings to the A&P mechanics license after successfully completing the factory course of instruction.

CHAPTER 3

RESEARCH METHOD

An opinion survey of the same type as used by Johnson and Ziegler was considered the most appropriate format for this type of project. The questionnaire used by Johnson and Ziegler was revised and the questions were restructured to more accurately reflect the perceptions held by the members of the aviation maintenance industry. The questionnaire was also shortened in an effort to secure a more favorable response rate.

The aviation maintenance industry is immensely large, and the cost of processing and mailing a survey encompassing all of the population would be prohibitive. Therefore, a sample of one hundred repair facilities, were selected from the World Aviation Digest listing of aircraft maintenance facilities. The shops selected were certificated for airframe and/or powerplant maintenance, and the mailing address must be within the continental limits of the United States.

The data collection instrument was a two-page questionnaire consisting of nine specific areas calling for a total of 24 separate responses, to survey the opinions held by the maintenance shop supervisors regarding skills, knoweldge, and attitudes of the apprentice

mechanics as perceived by the employers of these maintenance school graduates.

The questionnaire was designed to be brief, so that a higher response rate might be expected. A survey of this type is always an imposition on the time of the subjects, and although accurate data is desired for an objective analysis of the data collected, we did not wish the questionnaire to be of such a length that it would be relegated to the trash can rather than being returned.

A space was provided for additional comments at the end of the questionnaire in case the respondents desired to add further input into the survey. These comments will be tabulated and made a part of the study.

The data collection procedures were accomplished in chronological order as follows:

1. The mailing list was compiled as explained previously. The questionnaire was then prepared and submitted to several instructors at S.I.U. Aviation Maintenance Technology for their comments, so as to avoid any personal bias which may have inadvertently been included.

2. A cover letter was prepared to accompany the questionnaire and to explain its purpose. A statement as to the anticipated outcome of the survey was made in the cover letter, the hope that a better trained and more useful employee would result from this study.

3. The first mailing made on October 5, 1984, included the cover letter, the two-page questionnaire, and a stamped, self-addressed envelope for returning the questionnaire.

4. A two-week time limit was established from date of first mailing for reply to the qeustionnaire. Friday, October 19, 1984 was selected as the date to start follow-up action on non-respondents.

5. After the two-week time limit had passed, a follow up letter, and another copy of the questionnaire, and another self-addressed envelope was mailed to all those who had responded to the first mailing.

6. An additional week was allowed for reply. If, after this date no answer had been received, a post card was mailed on October 26, asking the subject to please complete and return the questionnaire.

7. An additional one week was allowed for response to the final request and for any other last minute replies. The compilation of the data was started on November 2, 1984.

8. The 24 responses to the questions were tabulated using the Likert scale and percentages were computed and tabulated to summarize the data. The information was graphically portrayed in some cases to more effectively present the data.

9. Additional comments received from the respondents were listed at the end of the report and were commented on if necessary to clarify any information received from the field.

CHAPTER 4

SUMMARY OF THE DATA COLLECTED

A complete report of the findings and comments received is included in this paper and attached as Appendix A. Even though the response rate was not as high as had been originally hoped, the results do represent an accurate evaluation of the opinions held by the aviation industry. There were no surprises and the opinions received from the aviation industry do parallel the findings of the Johnson and Zeigler National Opinion Survey of 1979.

The Johnson and Zeigler survey was directed to aviation educators, 50% of those respondents indicated that the A&P maintenance school curricula should be updated every two years. 66% of the aviation industry indicated that they would like to see the A&P curricula upgraded.

The National Opinion Survey of 1979 revealed that 48% of the aviation educators wanted additional specialist ratings for the A&P license, while 63% thought that the A&P maintenance instructors should have at least two years experience in the field before teaching, 69% wanted less time spent on wooden structures, and 66% agreed that more time was necessary for turbine engine instruction. The opinions on these same topics from the aviation industry ran considerably higher on most, with the question of additional specialist ratings receiving only 45% agreement. However, 97% of the industry think that A&P maintenance instructors should have at least two years exper-

ience before teaching, 83% agree that less time should be devoted to wooden structures, and 77% indicate more instructional time is needed for turbine engines.

There appears to be considerable apathy in the aviation industry regarding surveys of any kind. The initial response from the 100 aviation industry members was only 32%. A follow up letter was prepared and mailed requesting that the original questionaire be returned as soon as possible. This request generated an additional seven (7) responses. On November 1st, a telephone call was made to three of the non-respondents and for the next 15 days, one to two calls per day were made to solicit a response to the questionaire. A total of sixty-eight replies was realized by these methds and on November 26th, the decision was made to begin the data analysis.

The apparent lack of interest in the training aspects of the aviation industry may be partly explained by reading the comments received from the respondents. These comments are attached to this report as Appendix B.

Another observation which can be made after reading the comments submitted by the survey participants is that the employers of the A&P maintenance school graduates expect far too much from the schools and the new employee. The average employers, judging from the diversity of comments received, appear to expect the newly licensed technician to be thoroughly trained in every type aircraft from the Piper J-3 Cub to the Cessna Citation.

Over 98% of the respondents advocated additional training

in a variety of subjects, yet few wished to change or reduce training in the present curriculum. The time must be found somewhere to accomodate these requests, either a reduction or elimination of training in the basic subjects.

Question # 1, additional specialized rating necessary for helicopter, avionics, etc. 51% agreed, 34% wanted no change, and 13% disagree with the need for these ratings. Question # 3 requirement that A&P maintenance schools evaluate their curriculum every two to five years was in strong agreement among the respondents. Only 9% disagreed, with 17% wanting no change every two years, but this same 17% strongly agreeing that a change every five years was necessary.

In the "General" subject area of the A&P maintenance school subjects, a strong agreement among the respondents was evident that additional training was necessary in two of the subjects listed on the questionaire and no change in the remaining two. 77% of the respondents want additional training in basic electricity, and 71% think additional training is needed in maintenance publications. The opinions are almost equally divided as to the necessity for additional training in aircraft weight and balance and cleaning and corrosion control. 54% want no change in the present level of training, while 45% think additional training is required in cleaning and corrosion control and aircraft weight and balance.

The "Airframe" subjects reveal a strong opinion toward increased training in electrical systems (86%), sheet metal structures (68%), airframe inspections (83%) and aircraft

finishes (48%). While the respondents recommended no change in the subject of wood structures (54%), aircraft coverings (63%), and welding (54%). These opinions expressed by the survey participants tend to conform to the industry movement away from dope and fabric and welded steel fuselage construction.

The "Powerplant" subjects received almost unanimous agreement that increased training was necessary. Inspection and trouble shooting procedures received an amazing 94% agreement. Turbine engine training resulted in a 77% agreement in favor of additional training, followed closely by ignition systems (68%), and electrical systems (68%). Fuel systems training was also thought to be a candidate for increased training by 66% of the survey respondents, with propeller systems coming in last with 54% favoring increased time. It is interesting to note that only 2% of the total respondents indicated a need for a decrease in training requirements in the powerplant subject areas.

Question # 7 concerning the adequacy of the newly graduated A&P mechanic found that only 62% of the survey participants agreed that the new mechanics are not adequately trained. 17% wanted no change in the present curriculum, and only 11% disagreed with the statement, which indicates that only 11% feel that the newly licensed technician is properly trained.

Question # 8 and # 9 covered a specialized rating requirement for helicopter maintenance, bonded, composite construction techniques. 45% of the survey respondents thought the two

ratings were necessary, but 29% wanted no change in the present helicopter training, while 25% indicated that no special rating is thought necessary. The bonded, composite construction training was considered adequate by 26%, with 29% indicating that they thought no such rating was necessary.

A large number of the respondents took advantage of the chance to express their feelings on a variety of the subjects covered by the questionaire. All of these comments are attached to this report as Appendix B, but a few are worthy of comment here.

Question # 2 regarding A&P school instructor experience received differing comments. From Conneticut: "This can vary too much, and changes widely with the person involved". From Wisconsin, a respondent writes: "5 or more years with on the job experience at least every other year during off time should be mandatory".

Question # 7 received the most comments regarding the adequacy of the new mechanic and a few of these follw. From Conneticut: "It is only a beginning point, schools cannot be specific enough to prepare an experienced mechanic". From Nevada: "Most newly certified mechanics have a minimum knowledge to start as an apprentice, unless they have had some type of maintenance training or experience outside of A&P school". From Wisconsin: "Most new mechanics have no idea of the scope of a 100 hour or Annual Inspection. I believe the reason for this is that many of our instructors are so far removed from

the actual business that they cannot effectively teach the subject". Finally from Arizona: "Most schools push the students so fast that they do not even know how to sweep the floor. Also they teach the test, so in most cases, they are no good to the industry for two (2) to three (3) years".

CHAPTER 5

RECOMMENDATIONS

There are almost as many questions raised by this survey as there were answers. It would be interesting to replicate this survey in two or three years. This would allow time for the aviation industry to recover from the recession of the past few years. In addition, the sample size of 100, selected for this survey could be expanded to include additional respondents.

A large number of respondents (97%) indicate that they believe the A&P maintenance school instructors should have field experience before teaching. Several indicated that recurrent training every other year should be a requirement. Perhaps there should be some plan developed between the industry and the educators which would allow instructors to take a leave of absence from academic duties and work in the field with industry for one year or longer. In this way, the instructors would not have to resign their teaching post in order to gain the experience that all seem to agree would be beneficial.

The National Opinion Survey of 1979 identified two populations concerned with the problems in general aviation, and that opinion survey was directed to the aviation educators, while this paper is directed to the other population, the aviation industry itself. But there is a third population which seems to have been overlooked. A&P maintenance graduates. Perhaps an opinion survey directed to this segment would reveal

some interesting insights to the problems facing general aviation.

The following recommendations are suggested as a result of the data gathered during this survey.

1. A copy of this report should be forwarded to the Federal Aviation Administration, and to the Aviation Technical Education Council for their information and any action they deem necessary.

2. The data in this report should be condensed and submitted to aviation trade journals for possible publication to inform the aviation industry of the information obtained by the survey.

3. An additional survey of the aviation industry should be made within the next few years to update the information.

4. An additional survey should be implemented to solicit the opinions of the recent A&P maintenance school graduates.

5. A survey of the industry as to the expectations they hold as to what the newly licensed technician should know. The industry's opinion of their responsibilities for providing additional training should be solicited.

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APPENDIX "A"

Q U E S T I O N N A I R E

IS THE NEWLY CERTIFIED MAINTENANCE TECHNICIAN EMPLOYABLE AND QUALIFIED TO SERVICE MODERN AIRCRAFT SYSTEMS?

Name of your firm: _____
(Optional)

Type of maintenance operation: _____

Number of maintenance technicians employed: _____

Your primary responsibility in the maintenance operation:

_____
(Administration, Personnel, Supervision, Technical, etc.)

Q U E S T I O N S	STRONGLY AGREE	AGREE	NO CHANGES	DISAGREE	STRONGLY DISAGREE
1. Additional specialized ratings (helicopter, avionics, turbine mechanics, etc. are needed after a basic A&P mechanics license is obtained.	17%	34%	34%	8%	5%
2. A&P maintenance instructors should have two or more years field experience before teaching.	71%	26%	3%		
3. Maintenance schools should be required to complete a formal evaluation of their curriculum: every two (2) years	26%	40%	17%	6%	3%
every five (5) years	17%	20%	51%		
4. Additional training is needed in the following A&P maintenance school "General" subjects:	60%	17%	20%	3%	
a. Basic electricity	14%	31%	54%		
b. Cleaning and corrosion control	11%	34%	54%		
c. Aircraft weight and balance	40%	31%	28%		
d. Maintenance publications					

	STRONGLY AGREE	AGREE	NO CHANGES	DISAGREE	STRONGLY DISAGREE
5. Additional training is needed in the following A&P maintenance "Airframe" subjects:	2%	6%	54%	29%	9%
a. Wood structures	2%	6%	63%	26%	3%
b. Aircraft coverings	11%	37%	43%	9%	
c. Aircraft finishes	14%	54%	32%		
d. Sheet-metal structures	12%	23%	54%	11%	
e. Welding	37%	46%	17%		
f. Airframe inspection	63%	23%	11%	3%	
g. Electrical Systems					
6. Additional training is needed in the following A&P maintenance "Powerplant" subjects:	37%	40%	23%		
a. Turbine engines	51%	17%	17%		
b. Electrical systems	31%	37%	31%		
c. Ignition systems	26%	40%	34%		
d. Fuel systems	60%	34%	6%		
e. Inspection and troubleshooting	20%	34%	43%	2%	
f. Propeller systems					
7. Graduates of A&P maintenance schools are not adequately trained for today's aircraft.	28%	34%	17%	11%	
8. A specialized rating for helicopter maintenance (rotary wing aircraft) is needed.	8%	37%	29%	17%	8%
9. A specialized rating for bonded and composite construction aircraft is needed.	11%	34%	26%	23%	6%

10. Your comments are welcome regarding the qualifications of newly certificated mechanics as you perceive them. (Use additional pages if you wish.)

APPENDIX "B"

RESPONDENT'S COMMENTS

From Conneticut

Ques. #2 That can vary too much and change widely with the person involved.

Ques. #7 It's only a beginning point, schools cannot be specific enough to prepare an "experienced mechanic".

Ques. #8 "Qualifications": That should be left up to the employer, not a separate license.

Ques. #9 Same as #8; employer isn't going to have unqualified people working: don't be that specialized.

General: Mechanics graduating from A&P schools are trained to pass the FAA test. This gives them a good starting point, but in no way prepares them for anything specifically. The employers and manufacturers will continue their training along with self study and fellow employees.

From Arizona

General: Lack of experience would be my only concern with recent graduates of a maintenance training school. Aggressiveness in learning more in a hands on situation is important in the individual. We have found that the individuals personality, ambition, and adaptability are critically important in his being an important contributor to the overall operation. XXXX Aircraft recently terminated it's business which was primarily aimed at the DC-3, 4, 6, & 7 and other large reciprocating engine aircraft in maintenance and modification. We are still in the consulting end of the business.

From Texas

General: As my position dictates the hiring of A&P's and being an IA myself with a degree in Aviation Technologies, I feel the quality of today's "90 day" mechanics is very sub-standard and basically only qualified to pass the written exams. FAA requirements are at least 10-15 years behind the current maintenance practices and technology. I feel, as do many others in my position, that today's graduates, for the most part, aren't worth the time to train (or retrain) depending on where they came from, when there are so many experienced A&P's with a profitable knowledge and on the market right now. I really believe this will cause a severe shortage of good, qualified, and experienced mechanics and a large excess of "90 day wonders", that nobody will touch. If schools would train people in the "systems and techniques" of today's aviation and not of yesteryear, this serious situation could possibly be avoided. Please feel free to contact me for more information or input.

From Texas

I believe more electrical training is necessary. Looking toward future changes, may I strongly recommend more training in trouble-shooting courses. The rising cost of maintenance hours demands mechanics with the ability to visualize a system and use systematic approaches (T/S) to find problems. A very strong asset to any A/P establishes his/her value to this field.

From Nevada

Most newly certified mechanics have a minimum of knowledge to start as an apprentice, unless they have had some type of maintenance training or experience outside of A&P school.

From Conneticut

I feel that most schools (including the one that I attended) do not have enough new (modern) equipment for trainees to work on. I was well versed in radial engines, pressure carburetors, wood, dope and fabric, while I was lacking in turbines, electronics, and composites. If the industry could begin a program to upgrade the equipment a school had at it's disposal, we could insure technicians who were well trained, could be produced (by the school), and not just students taught to pass a test. Perhaps local F.B.O.'s could donate used equipment as a tax donation to schools to provide a constant source of modern equipment.

From Wisconsin

Ques. #9 A good mechanic can be trained in the field, we have not hired for about five years. You can teach and teach, but you will never equal on-the-job experience, now or in the near future. It seems the good student, with good hands, will be successful.

From New York

New mechanics are not taught to properly sign off a log book, i.e. proper nomenclature, penmanship, spelling and the importance of a proper signoff. Electrical theory and systems should be stressed.

From Washington State

Specialized training is needed for rotary wing, bonded and composite structures, and many other large aircraft after the basic A&P rating has been obtained.

From Wisconsin

Ques. #2 Five or more years with on-the-job experience mandatory at least every other year during off time.

From Florida

1. Licensed A&P mechanics just recently out of an FAA approved maintenance school seem to lack "hands-on" experience of operational aircraft.

2. Many A&P mechanics lack basic mechanical skills.

3. A&P mechanics need more training on the subject of FAA Rules and Regulations.

4. I feel that prior to licensing a new A&P mechanic, he/she should be required to work with a licensed A&P for a period of thirty days. This would give the new mechanic on-the-job training in the every day useage of tools, manuals, rules and regulations, and field trouble-shooting procedures.

5. XXXXXXX XXX Services, inc. employs, on a part-time basis, numerous freshly licensed A&P mechanics, all of whom state that the "hands-on" training that myself and other supervisors give them on "live" aircraft is invaluable.

From Wisconsin

Basic courses such as English and math should not be a part of the course, rather prospective students should be tested in these areas as a prerequisite. Most new mechanics have no idea of the scope of a 100-hour or Annual inspection. I believe the reason for this is that many of the instructors are so far removed from the actual business that they cannot effectively teach the subject.

From Florida

Students need more practical hands-on experience.

From Arizona

Most schools push the students so fast they do not even know how to sweep the shop floor. Also they teach only the test, so in most cases, they are no good to the industry for two to three years.

APPENDIX "C"

Southern Illinois
University at Carbondale
Carbondale, Illinois 62901

October 5, 1984

Dear Sir:

The aviation industry needs your help in answering the following question: "Is the newly certified maintenance technician employable and qualified to service modern aircraft systems?" That question was asked in the 1982 "National Opinion Survey" conducted by Dr. William B. Johnson and Mr. Charles F. Ziegler and sponsored by the Aviation Technical Education Council. The survey was conducted by the Aviation Research Laboratory of the University of Illinois, at the request of the A.T.E.C. members.

One of the recommendations made by this team was that another study should be made to solicit the opinions of the aviation industry managers regarding their perceptions of the F.A.A. approved Airframe and Powerplant Maintenance School graduates.

Your organization has been randomly selected to participate in this opinion survey. You are being asked to express your opinions, and in addition, make any other comments you choose regarding the newly certificated maintenance technicians trained in the F.A.A. approved maintenance schools.

A few minutes of your time to complete the enclosed questionnaire will be greatly appreciated. Your input to this study will be presented to the F.A.A. and to the industry after the data has been compiled and analyzed. It is sincerely hoped that this data, together with the data collected in the first study will be used to update F.A.R. Part 147 and the A&P maintenance school curriculum.

Thank you for your participation. A self-addressed return envelope is enclosed for your use.

Sincerely,

Benjamin H. O'Brian
A&P - I.A. - D.M.E.
Instructor - Aviation Maintenance
Southern Illinois University

Appendix "C"

APPENDIX "D"

Q U E S T I O N A I R E

IS THE NEWLY CERTIFIED MAINTENANCE TECHNICIAN EMPLOYABLE AND QUALIFIED TO SERVICE MODERN AIRCRAFT SYSTEMS?

Name of your firm: _____
(Optional)

Type of maintenance operation: _____

Number of maintenance technicians employed: _____

Your primary responsibility in the maintenance operation:

_____
(Administration, Personnel, Supervision, Technical, etc.)

	STRONGLY AGREE	AGREE	NO CHANGES	DISAGREE	STRONGLY DISAGREE
1. Additional specialized ratings (Helicopter, avionics, turbine mechanics, etc. are needed after a basic A&P mechanic's license is obtained.					
2. A&P maintenance instructors should have two or more years field experience before teaching.					
3. Maintenance schools should be required to complete a formal evaluation of their curriculum: every 2 years					
every 5 years					
4. Additional training is needed in the following A&P maintenance school "General" subjects:					
a. basic electricity					
b. cleaning and corrosion control					
c. aircraft weight and balance					
d. maintenance publications					

	STRONGLY AGREE	AGREE	NO CHANGES	DISAGREE	STRONGLY DISAGREE
5. Additional training is needed in the following A&P maintenance "Airframe" subjects:					
a. wood structures					
b. aircraft coverings					
c. aircraft finishes					
d. sheet-metal structures					
e. welding					
f. airframe inspection					
g. electrical systems					
6. Additional training is needed in the following A&P maintenance "Powerplant" subjects:					
a. turbine engines					
b. electrical systems					
c. ignition systems					
d. fuel systems					
e. inspection and troubleshooting					
f. propeller systems					
7. Graduates of A&P maintenance schools are not adequately trained for today's aircraft.					
8. A specialized rating for helicopter maintenance (rotary wing aircraft) is needed.					
9. A specialized rating for bonded and composite construction aircraft is needed.					

10. Your comments are welcome regarding the qualifications of newly certificated mechanics as you perceive them. (Use additional pages if you wish.)

APPENDIX "E"

Southern Illinois
University at Carbondale
Carbondale, Illinois 62901

October 26, 1984

Dear Sir:

We mailed a letter to you on October 5, asking your help in answering the question: "Is the newly certified maintenance technician employable and qualified to service modern aircraft systems?" Three weeks have passed and we regret to say that we have not received a reply to our questionnaire which we enclosed in the letter.

Would you please return this questionnaire in the stamped, self-addressed envelope we enclosed in our original letter? This information is vital to the future of aviation maintenance training, and your input to this opinion survey may be very important.

I am sure you agree that something must be done to upgrade the training received by A&P maintenance school graduates. Now is your chance to let your feelings on this subject be known. We will consolidate the replies received to this questionnaire, and summarize them for publication and this data will be forwarded to the F.A.A. so that action may be started to update the training standards as prescribed by F.A.R. Part 147.

Thank you again for your participation. We look forward to receiving your reply to our questionnaire and any comments you may wish to make.

Sincerely,

Benjamin H. O'Brian
Instructor - Aviation Maintenance
Southern Illinois University
Carbondale, IL 62901

APPENDIX "F"

Mailing List

AERODYNE, Corp.
5200 W. Military Hwy.
Chesapeake, VA 23321

Aero Services Milwaukee, Inc.
Attn: William Oerichbaier
Gen. Mitchell Field
923 E. Layton Ave
Milwaukee, WI 53207

Airborne, Corp.
Box 50, Rt. 1
Sylvester, GA 31791

Airborne Overhaul, Inc.
6848 Farmdale Ave
North Hollywood, CA 91605

Air Center, Inc.
Box 321168
Wiley Post Airport
Oklahoma City, OK 73123

Air Wilmington, Inc.
Box 869
Wilmington, NC 28402

AIRWORK CORP.
Attn: Earl Grace
Municipal Airport
Millville, NJ 08332

ALAIR AVIATION SERVICES, INC.
Aurora State Airport
14337 Keil Rd, N.E.
Aurora, OR 97002

All Aircraft Services
Attn: Jack Cummins
2801 E. Spring Street
Long Beach, CA 90806

Alpine Aviation, Inc.
Box 691
Provo, UT 84603-0691

American Flying Associates
Box 161079
Hanger 5
Memphis, TN

A.A.R. Oklahoma, Inc.
Box 59100
Will Rogers World Airport
6611 Meridian Rd
Oklahoma City, OK 73159

AAR Western Skyways, Inc.
Portland-Troubdale Airport
Troutdale, OR 97060

Aces Aircraft
Box 35A Route 2
Greenfield, IA 50849

Acme Aircraft Co.
Box 26545
Tucson, AZ 85726-6545

Ada Aircraft Maintenance
Box 324
Ada, OK 74820

Aero Associates
Hanger 8-4
Jefferson County Airport
Broomfield, CO 80020

Aero Corp.
Box 1909
Lake City, FL 32056-7911

Aerocrafter Winslow
Box 261
Winslow, AZ 86047

AEROCRAFTSMAN
Box 362
Ridgeland, SC 29936

Corporate Jets, Inc.
14600 N. Airport Dr.
Scottsdale, AZ 85260

Cothron Aviation
5104 S. Collins
Airlington, TX 76014

Cross Country Aviation Corp.
The Flite Center, Inc.
Brainard Airport
Hartford, CT 06114

Crystal Shamrock, Inc.
6000 Douglas Dr. N.
Minneapolis, MN 55429

CSX BECKETT AVIATION, INC.
Box 81040 AMF
Cleveland, OH 44181

Downtown Airport, Inc.
Box 94896
1701 S. Western
Oklahoma City, OK 73109

General Air Services, Inc.
Miami Int'l Airport, Bldg. 1033
Box 522822
Miami, FL 33152

General Aviation Corp.
Rock County Airport
Janesville, WI 53545

Central Texas Engines
9503 Middlex
San Antonio, TX 78817

C G Air Center
Box 831
Greenville, MS 38701

Cherokee Aviation, Inc.
Box 1586
Gladewater Municipal Airport
Gladewater, TX 75647

Chesterfield County Airport
P.O. Box 40
Chesterfield, VA 23832

Chrome Plate
Engine Components, Inc.
9503 Middlex Rd.
San Antonio, TX 78217

Chuck's Aircraft, Inc.
670 Airport Blvd.
San Carlos, CA 94070

CLOVER PARK VOC-TECH SCHOOL
Aviation Department
4500 Stellacoom Blvd. S.W.
Tacoma, Wash. 98499

Clydesdale Aircraft, Inc.
3850 E. Fifth Ave
Columbus, OH 43219

Coastal Aviation Industries, Inc.
Wallingford Rd.
Danbury, CT 06810

COMBS GATES BRADLEY, INC.
Hanger 574 & Learjet Service Center
Bradley Int'l Airport
Windsor Locks, CT 06096

BEECHCRAFT EAST, INC.
Hanger 4 Republic Airport
East Farmingdale, NY 11735

BEECHCRAFT WEST
7240 Hayvenhurst Ave
Van Nuys, CA 91406

Big Bend Community College
Aviation Dept. Bldg 3000
28th & Chanute St.
Moses Lake, WA 98837

Boise Air Service, Inc.
3200 Airport Way
Boise, ID 83705

Bridgeport Flight Service, Inc.
Sikorsky Memorial Airport
S. Main St.
Stratford, CT 06497

Business Air Center
Box 22460 Ft. Lauderdale-Hollywood
Int'l Airport
900 S.W. 34th Street
Ft. Lauderdale, FL 33335-2460

Cal-Pacific Airmotive, Inc.
1330 Mercer Way
Salinas, CA 93905

Cav-Air, Inc.
Hanger 15
5500 N.W. Terrace
Ft. Lauderdale, FL 33309

CC&M Aviation Maint. Div.
Medford Municipal Airport
Rt. 1, Box 331
Medford, OK 73759

Associated Air Center
Box 20718
8321 Lemmon Ave
Dallas, TX 75220

Associated Air Services, Inc.
701 S.W. 48th Street
Ft. Lauderdale, FL 33316

Austin Jet Corp.
Box 13201
Austin, TX 78711

Aviation Contract Services
205 Ross St.
Pittsburg, PA 15219

Aviation Maintenance, Inc.
1575 W. Commercial Blvd.
Ft. Lauderdale, FL 33309

Aviation Technical Support, Inc.
Blvd. 11-4 Airline Dr.
Waco, TX 76705

Baron Enterprises, Inc.
Marion Airport
1530 Pole Lane Rd.
Marion, OH 43302

BARRE AVIATION, INC.
4906 Pine Hill Rd.
Albion, NY 14411

BATCH-AIR, INC.
Box 522187 Bldg T-2146
Miami Int'l Airport
Miani, FL 33152

Baton-Rouge Beechcraft, Inc.
Ryan Airport
Bayton-Rouge, LA 70807

BAUER FLYING SERVICE
Clare Municipal Airport
Clare, MI 48617

High Range Aviation, Inc.
Box 328
Gooding, ID 83330

Hill Aero, Inc.
P.O. Box 80945
Municipal Airport
Lincoln, NE 68524

Hill Air Co., Inc.
4300 S.W. 12th Terrace
Ft. Lauderdale, FL 33315

Hoffman Aircraft, Inc.
Clovis Municipal Airport
Rt. 1 S.W. Hangers
Texico, NM 88135

Holman Aviation Co.
Box 228, Int'l Airport
Great Falls, MT 59403

Houston Beechcraft, Inc.
8402 Nelms
Houston, TX 77061

Huntsville Aviation
Rt. 1, Box 142
Huntsville, TX 77340

JSH Aviation, Inc.
Attn: Ron Mofford
1564 N. Elma School Rd.
Mesa, AZ 85201

KABEL-AIR
Chambersburg Airport
3506 Airport Rd.
Chambersburg, PA 17201

K-Air, Inc.
Box 396-B R.D. 1
Latrobe, PA 15650

Kansas City Flying Service
601 Lou Holland Dr.
Kansas City, MO

KEY AIRLINES, INC.
Attn: Maintenance Dept.
Box AMF 22065
Salt Lake City, UT 84122

Kingman Aviation, Inc.
Div.: Golden Pacific Airlines
4705A The Concourse
Kingman, AZ 86401

KITTY HAWK MAINT., INC.
Suite 200
8034 Aviation Place
Dallas, TX 75235

Memphis Aero Corp.
Box 30105 Int'l Airport
Memphis, TN 38130

KLOCK
1366 Tolland Turnpike
Manchester, CT 06040

Lentini Aviation, Inc.
1661 N. Airport Rd.
Pontiac, MI 48054

Lock Haven Airmotive Co.
Box 544
E. Water Street
Lock Haven, PA 17745

LOVE AVIATION
220 Airport Rd
Cloverdale, CA 95425

Love Aviation, Inc.
Box 20219
One Love Aviation Place
Dallas, TX 75220

LUMANAIR, INC.
Box 1146
Aurora Municipal Airport
Aurora, IL 60507

Martin Aviation, Inc.
19331 Airport Way S.
Santa Ana, CA 92707

Montgomery Aviation Corp.
Box 92
Montgomery, AL 36195-3501

MOUNTAIN AIRCRAFT ENGINES
Box 488
Denver, NC 28037

MOUNTAIN AIR, INC.
Box 246
Wood County Airport
Williamstown, WV 26187

MOYER AVIATION, INC.
P.O. Box 275
Rt. 611 Pocono Mts. Airport
Mt. Pocono, PA 18344

NAZARIAN AVIATION CORP.
Essex County Airport
125 Passaic Ave
Fairfield, NJ 07006

Northwest Air Service, Inc.
Boeing Field Int'l
7575 Perimeter Rd S.
Seattle, WA 98108

GEORGE J. PRIESTER AVIATION SERVICE
Palwaukee Airport
Wheeling, IL 60090

RAS MAINTENANCE DIVISION
Allentown-Bethlehem-Easton Airport
Hangar #3
Allentown, PA 18103

Reno Flying Service
2601 E. Plumb Land
Reno, NV 89502

Monarch Aviation, Inc.
P.O. Box 520756
Miami, FL 33152

MONARCH AVIATION, INC.
Box 527
Monterey Peninsula Airport
Monterey, CA 93940

Midwestern Aviation
Rt. #3
Beloit, KS 67420

Milford Air Park, Inc.
R.D. 2
Milford, DE 19963

MILLER AIR MAINTENANCE
Box 22, Rt. 1
Canadian, TX 79014

J.W. MILLER AVIATION, INC.
Box 7757
Horseshoe Bay Airport
Marble Falls, TX 78654